PRINCIPLES OF TEST CREATION

A Self-Instructional Handbook for BYU Educators

PURPOSE

This handbook is designed to help instructors create assessment tools that will meet the following goals:

1. Be properly aligned with the course intended learning outcomes and what was taught in class.
2. Assess higher-order thinking
3. Assess what the instructor intended to assess; not extraneous ideas or skills.
4. Be clear and precise.
5. Be properly formatted
6. Be easy to score
7. Be relevant to students
8. Discriminate between students

GENERAL PROCEDURE

The handbook is organized into three parts. In each section specific principles of test creation are presented. Then, a formative exercise assesses understanding of the principles of test creation. Finally, an answer key is provided so that answers can be checked.

This three part format is followed in explaining principles of test creation, which are related to each of the major types of test questions commonly used, to alignment and to the assessment of higher-order thinking.

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PRINCIPLES FOR MULTIPLE-CHOICE QUESTIONS

A. The stem* of the question should present a clear and complete problem, (e.g., “Who wrote the Declaration of Independence?”)

B. The questions should not clue the students to the correct answer*:

1. The stem of the question should agree grammatically with each choice.

2. The options* should be similar in length and amount of detail.

3. All options should seem plausible to the uninformed.

C. If the question is controversial, an authority or theory should be referred to as support, (e.g., “According to most German historians, which of the following caused World War II?”)

D. It is generally suggested that negative words be avoided in the question stem. If included, any negative word should be capitalized and/or underlined and bolded, (e.g., “Which of the following is **NOT** an item of mountain climbing gear?”)

E. Each option should concisely state only one idea.

F. The option “All of the above” should not be used, as it increases the chance of correctly guessing the right answer. It is also better to have three or more good options rather than to use “None of the above” as a choice. Questions that use “All of
the above” and “None of the above” as options can be replaced with questions that ask students to pick all of the choices, which may be correct.

G. All options should be as homogenous or similar as possible.

H. Avoid complex multiple-choice formats, (e.g., both A and B, both B and C, etc.)

I. Order the options to each question alphabetically.

J. List options vertically, not horizontally.

K. The stem of a question should be written as a question, not as an incomplete sentence.

* See **Anatomy and Glossary of Terms** for a definition.

FORMATIVE EXERCISE: MULTIPLE-CHOICE QUESTIONS

Instructions: The following questions are designed to assess your understanding of the principles for writing multiple-choice questions. Demonstrate your ability to identify which, if any, of the principles have been violated by writing the number and letter of the principle violated in the box on the left. If one or more principles have been violated, rewrite the question in the box provided.

	Principles Violated	Possible Corrections
1.		
2.		
3.		
4.		

Multiple-Choice Questions

1. Which of the following is not a mammal?
a. Horse
b. Whale
c. Iguana
d. Human

2. In Europe, before the use of coal during the industrial revolution, the most important and reliable energy source for small-scale manufacturing was:
a. Hydrothermal power b. Water power
c. Wind power d. Wood fuel

3. What geographic feature would have been important 1000 years ago in choosing a location to build a city, but would not be very important today?

A) Near a high point
B) Near a river
C) Near natural resources
D) Near the ocean

4. George Washington
a. died at a young age as compared with other men of his day, discounting those killed in the Revolutionary War.
b. was quite successful at overcoming the resistance afforded by the British war machine.
c. was the third President.
d. wore his original teeth until he died.
e. had three daughters who married prominent diplomats or statesmen.

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6.		
7.		
8.		
9.		
10.		

5. The leader of a civil revolt is called a:
a. usurper
b. revolutionary
c. individual
d. enthusiast
e. All of the above

6. World War II was mostly the fault of:
a. France, because of de Gaulle's policies
b. Britain, because of Chamberlain's policies
c. Germany, because of Hitler's policies
d. America, because of Roosevelt's policies
e. Tibet, because of Meshoe's policies

7. Which statement **best** illustrates a connected meaning with the word *wrasse*?
a. He ate it whole.
b. I saw one swimming.
c. People are greedy.
d. Tomorrow is coming.

8. Elephants lift objects mainly with their:
a. legs
b. trunks
c. tusks
d. None of the above

9. The Richter scale is:
a. used to measure the intensity of light.
b. based on an ordinal scale.
c. invented by George Galton.
d. used to measure the intensity of earthquakes.

10. A sponge is a/an:
a. invertebrate
b. mollusk
c. porifera
d. both "a" and "b", but not "c"
e. both "a" and "c", but not "b"
f. both "b" and "c", but not "a"

ANSWER KEY: MULTIPLE-CHOICE

	Principles Violated	Possible Corrections
1.	D, G, I	Which of the following is a mammal? a. A sea horse b. A shark c. A whale
2.	J, K	In Europe…what was the primary energy source? a. Hydrothermal power b. Water power c. Wind power d. Wood fuel
3.	OK	
4.	A, B2, E, G, I, K	…, what was George Washington's profession? a. A colonial governor b. A medical doctor c. A spy d. A surveyor
5.	B1, B3, F, I, K	What is the leader…called? a. A despot b. A radical c. A revolutionary d. An usurper
6.	B3, C, E, G, I, K	According to Durant, whose policies caused WW II? a. Chamberlain b. de Gaulle c. Hitler d. Roosevelt
7.	OK	
8.	F, K	Elephants mainly lift with what part of their bodies? a. Their legs b. Their mouths c. Their trunks d. Their tusks
9.	A, B1, I, K	What is the main purpose of the Richter scale? To measure the intensity of: a. earthquakes b. light c. sound waves d. water pressure
10.	H, K	What are sponges' classification? a. A cetacean b. A mollusk c. A porifera d. A vertebrate

Principles for Multiple-Choice Questions (Review)

A. The stem of the question should present a clear and complete problem.

B. The questions should not clue the students to the correct answer:

   1. The stem of the question should agree grammatically with each choice.
   2. The options should be similar in length and amount of detail.
   3. All options should seem plausible to the uninformed.

C. If the question is controversial, an authority or theory should be referred to as support.

D. It is generally suggested that negative words be avoided in the question stem. If included, any negative word should be capitalized and/or underlined and bolded.

E. Each option should concisely state only one idea.

F. The option "All of the above" should not be used. It is also better to have three or more good options rather than to use "None of the above" as a choice.

G. All options should be as homogenous or similar as possible.

H. Avoid complex multiple-choice formats.

I. Order the options to each question alphabetically (randomly.)

J. List options vertically, not horizontally.

K. The stem of a question should be written as a question, not as an incomplete sentence.

PRINCIPLES FOR MATCHING QUESTIONS

A. Write clear directions to the examinees.
   1. Specify the relationship between the premises and the responses.
   2. Describe how and/or where students should record the answers they select. (It is recommended that students record their answers on an answer sheet.)
   3. Indicate whether or not each response may be used once, more than once, or not at all.

B. Include an unequal number of premises* and responses*.

C. Restrict the entries in the response column to the members of a homogeneous category. Keep the premises homogeneous also.

D. Use a heading* at the top of each list.

E. Avoid the tendency to include insignificant or esoteric members of the target category.

F. Arrange the responses in some logical order that is consistent with the task of searching for a match for each premise (e.g., alphabetically, chronologically, numerically, or relative size.)

G. Keep all the premises and all the responses on the same page.

H. If possible, put definitions and longer words and phrases in the left column.

I. Include no more than 7 premises and ten responses per matching exercise.

* See **Anatomy and Glossary of Terms** for a definition.

FORMATIVE EXERCISE: MATCHING QUESTIONS

Instructions: The following questions are designed to assess your understanding of the principles for writing matching questions. Demonstrate your ability to identify which, if any, of the principles have been violated by writing the number and letter of the principle violated in the box on the left. If one or more principles have been violated, rewrite the question in the box provided.

	Principles Violated	Possible Corrections
I.		
II.		
III.		

Matching Questions

I. Match the following:

1. David	bad ruler
2. Madonna	history will remember
3. Solomon	good with a slingshot
4. Noah	good sailor

II. Match the left column with the right column:

1. Second President of the United States	a. Arizona
2. Died in a duel	b. Aaron Burr
3. Invented the light bulb	c. California
4. Lies west of Nevada	d. Thomas Edison
5. Was sunk by a U-boat	e. French horn
6. Became a state in 1912	f. Lusitania
	g. John Adams
	h. Walt Whitman

III. Match the left column with the right column:

1. Banana	a. yellow, long
2. Pear	b. orange-yellow, fuzzy
3. Apple	c. red, big pit
4. Cherry	d. red and round, firm
5. Peach	e. biggest at bottom, thin at top

IV. Match the invention, important event or discovery with the person who was responsible for it:

1. Invented movable type	a. Eli Whitney
2. First to fly	b. Orville Wright
3. Invented the radio	c. Thomas Edison
4. Early experimenter with liquid fuel rockets	d. Galileo
	e. Madame Curie
5. Invented telescope	f. Da Vinci

IV.		
V.		

6. Invented cotton gin
7. Developed relativity
8. Invented steam engine
9. Perfected wireless
10. Invented electric light

g. Wright Brothers
h. Ben Franklin
i. Elias Howe
j. Paul Goddard
k. Samuel Morse
l. G. Marconi

V. Match the following problems and solutions by drawing lines between each problem and the solution that is most nearly correct. There may be some solutions that match with more than one problem.

5 (-4)	-19
(-8) (4)	4
(-5) (-6)	3
(-17) (-2)	0
(-9) (-4) (-1)	1
5(-4) (-2)	-1
9(-8) (-2)	-9
0(18) (-17)	-3
(-21) / (-7)	5
15 / (-5)	-2
(-28) / (-7)	30
[(-3) (-18)] / (-27)	-32
(-27) / (-9)	34
(75) (0) (-8)	-36
[(-12) (6)] / 8	40

ANSWER KEY: MATCHING

	Principle Violated	Possible Corrections
I.	A1, A2, A3, B, C, D, E, H	Match the Famous Person with the Event for which the person is remembered. Each Famous Person may be used once, more than once or not at all. Event — Famous Person 1. The Fall — a. Adam 2. The Flood — b. David 3. 300 wives — c. Enoch 4. Goliath — d. Noah e. Saul f. Solomon
II.	A1, A3, C, D, E, F	Match the Famous America with the Event for which the American is remembered. Each Famous American may be used once, more than once or not at all. Event — Famous American 1. Second President of the U.S. — a. John Adams 2. Killed Alex Hamilton in a duel — b. Aaron Burr 3. Invented the light bulb — c. Thomas Edison 4. Third Vice President of the U.S. — d. Benjamin Franklin e. Thomas Jefferson f. Walt Whitman
III.	A1, A3, B, D, F, H	Match the Fruit with its Description. Each Fruit may be used once, more than once or not at all. Description — Fruit 1. yellow, long — a. Apple 2. red, big pit — b. Banana 3. round, fuzzy — c. Cherry 4. little on top, bigger on the bottom — d. Mango e. Orange f. Peach

Matching Principles (Review)

A. Write clear directions to the examinees.
   1. Specify the basis for matching premises and responses.
   2. Describe how and/or where students should record the answers they select.
   3. Indicate whether or not each response may be used once, more than once, or not at all.

B. Include an unequal number of premises and responses.

C. Restrict the entries in the response column to the members of a homogeneous category. Keep the premises homogeneous also.

D. Use a heading at the top of each list.

E. Avoid the tendency to include insignificant or esoteric members of the target category.

F. Arrange the responses in some logical order that is consistent with the task of searching for a match for each premise.

G. Keep all the premises and all the responses on the same page.

H. If possible, put definitions and longer words and phrases in the left column.

I. Include no more than 7 premises and 10 responses per matching exercise.

IV.	A3, C, D, E, F, I	Match the Invention with the Person who invented it. Each Person may be used once, more than once or not at all. Invention 1. Bifocals 2. Cotton Gin 3. Light bulb 4. Odometer 5. Radio 6. Steam Engine 7. Telescope Person a. M. Curie b. Da Vinci c. Edison d. Franklin e. Galileo f. Howe g. Marconi h. Morse i. Whitney
V.	A3, B, D, F, I	Match the Multiplication Problem with its Product. Each Product may be used once, more than once or not at all. Multiplication Problem 1. 5 (-4) 2. (-5)(-6) 3. (-8)(4) 4. (-9)(-4)(-1) 5. (2)(15) 6. (3)(-12) Product a. 36 b. 32 c. 30 d. 24 e. 20 f. -20 g. -24 h. -30 i. -32 j. -36

Matching Principles (Review)

A. Write clear directions to the examinees.
   1. Specify the basis for matching premises and responses.
   2. Describe how and/or where students should record the answers they select.
   3. Indicate whether or not each response may be used once, more than once, or not at all.

B. Include an unequal number of premises and responses.

C. Restrict the entries in the response column to the members of a homogeneous category. Keep the premises homogeneous also.

D. Use a heading at the top of each list.

E. Avoid the tendency to include insignificant or esoteric members of the target category.

F. Arrange the responses in some logical order that is consistent with the task of searching for a match for each premise.

G. Keep all the premises and all the responses on the same page.

H. If possible, put definitions and longer words and phrases in the left column.

I. Include no more than 7 premises and 10 responses per matching exercise.

PRINCIPLES FOR ESSAY QUESTIONS

1. Before writing the essay question, clearly define the intended learning outcome to be assessed.

2. Avoid using essay questions for intended learning outcomes that are better assessed with other kinds of assessment.

3. Clearly state the thinking processes (e.g., compare, analyze, evaluate, etc.) students are to use in writing their answers and require the students to use these thinking processes in a novel or previously unencountered problem situation.

4. Focus the essay question on specific course content. Make it clear what content and subject matter students should use in answering the question. (Generally, it is better to require students to use more specific content then broad or general content.)

5. Present a reasonable task to students.

6. Specify the relative point value and the approximate time limit in clear directions.

7. In the essay question, state the criteria that will be used to grade student responses.

8. Require students to answer all essay questions. Do not allow them to choose any essay to answer.

Additional Tips:

- The tasks given to students in an essay can be written as a statement or question, (e.g., Explain… .; Which… ?)
- Improve the essay question through preview and review.

Preview (before)

a. Predict student responses.
b. Write a model answer.
c. Ask a knowledgeable colleague to critically review the essay question, the model answer, and the intended learning outcome for alignment.

Review (after)

d. Review student responses to the essay question.

FORMATIVE EXERCISE: ESSAY QUESTIONS

Instructions: The following questions are designed to assess your understanding of the principles for writing essay questions. Demonstrate your ability to identify which, if any, of the principles have been violated by writing the number and letter of the principle violated in the box on the left. If one or more principles have been violated, rewrite the question in the box provided.

	Principles Violated	Possible Corrections
1.		
2.		
3.		
4.		
5.		
6.		

Essay Questions

1. Will Durant is sympathetic toward democracy but notes its instability as a form of government. Give your view of this, supporting it with facts that either support or contradict Durant's view. You have fifteen minutes for this question. You will not be graded on your opinion, but rather on how well you use what you have learned this semester to construct a logical argument (5 points).

2. List the steps in constructing an isosceles triangle with only a straightedge and compass. (4 points, 1 point for each step; approximately 15 minutes.)

3. Indicate the principles that were discussed in class on firsthand reporting.

4. Indicate the similarities of the Monroe Doctrine and the Nixon or Bush Doctrines.

5. In the Supreme Court case of Marbury v. Madison, the Federalist conception of the Constitution was perpetuated and the Supreme Court assumed some additional authority. State the major argument the Court used in this assumption of authority. Twenty-five points are possible, depending upon the accuracy of your response. (Approximately 25 minutes)

6. List the names of all the bones in the human body. One point will be given for each bone correctly listed. (Approximately 5 minutes)

ANSWER KEY: ESSAY

	Principles Violated	Possible Corrections
1.	OK	
2.	1, 2	*More appropriate as a short answer question than as an essay question. (This is a memorization item.)*
3.	1, 3, 4, 6, 7	Apply the principles on firsthand reporting to the following situation… You will earn one point for each step of the process correctly applied. (Approx. 10 minutes.)
4.	3, 6, 7, 8	Describe three ways in which the Monroe and the Nixon Doctrines are similar. (1 point per similarity; approximately 15 minutes.)
5.	2	*This question is acceptable as a memory-level short answer question.*
6.	2, 5	*There are over 200 hundred bones in the human body, so this is probably not a reasonable task for students to do, (especially not in 5 minutes.) Shorten and put in the short-answer section. (This is a memorization item.)*

Essay Principles (Review)

1. Before writing the essay question, clearly define the intended learning outcome to be assessed.
2. Avoid using essay questions for intended learning outcomes that are better assessed with other kinds of assessment.
3. Clearly state the thinking processes students are to use in writing their answers and require the students to use these thinking processes in a novel or previously unencountered problem situation.
4. Focus the essay question on specific course content. Make it clear what content and subject matter students should use in answering the question. (Generally, it is better to require students to use more specific content then broad or general content.)
5. Present a reasonable task to students.
6. Specify the relative point value and the approximate time limit in clear directions.
7. In the essay question, state the criteria that will be used to grade student responses.
8. Require students to answer all essay questions. Do not allow them to choose any essay to answer.

PRINCIPLES FOR SHORT ANSWER QUESTIONS

A. Word the item so that a clear, meaningful problem is presented.

B. Structure the question so that the range of acceptable responses is limited to a single correct answer or a narrow set of definite, clear-cut and explicit answers.

C. The required response should consist of no more than a few sentences or a short list of items.

D. If the question calls for a student answer other than memorized facts, he or she should be told the nature of the required response or the criteria against which his/her answer will be judged, (e.g., “Your answer must be accurate to at least two decimal places” or, “Your answer must include a reference to a major theory which supports your views.”

E. When using computational problems, specify the units and degree of precision that should be used in expressing the answer.

FORMATIVE EXERCISE: SHORT ANSWER QUESTIONS

Instructions: The following questions are designed to assess your understanding of the principles for writing Short Answer questions. Demonstrate your ability to identify which, if any, of the principles have been violated by writing the number and letter of the principle violated in the box on the left. If one or more principles have been violated, rewrite the question in the box provided.

	Principles Violated	Possible Corrections
1.		
2.		
3.		
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9.		

Short Answer Questions

1. Explain in some depth each of the probable causes of the Civil War.
2. List two ways in which neutrons and protons differ.
3. Explain in no more than three sentences why a match will not light on the moon.
4. Describe each of the twelve steps in fungal budding.
5. Why do trees have rings?
6. Correct the grammatical and spelling errors in this sentence by rewriting it correctly. "Dennys truck's ain't here yet."
7. Describe the process of writing an objective classroom test.
8. What is the area, of a circle having a diameter of 8 inches?
9. Who developed the 1916 Stanford-Binet Intelligence Scale?

ANSWER KEY: SHORT ANSWER

	Principles Violated	Possible Corrections
1.	C	List three probable causes of the Civil War.
2.	OK	
3.	OK	
4.	C	Describe in two or three steps the process of fungal budding.
5.	B	How do trees physically make rings? Explain your answer in two or three sentences.
6.	OK	
7.	D	List the four steps in writing an objective classroom test.
8.	E	What is the area, in square inches, of a circle that has a diameter of 8 inches?
9.	B	What is the full name of the person who developed the 1916 Stanford-Binet Intelligence Scale?

Short Answer Principles (Review)

A. Word the item so that a clear, meaningful problem is presented.

B. Structure the question so that the range of acceptable responses is limited to a single correct answer or a narrow set of definite, clear-cut and explicit answers.

C. The required response should consist of no more than a few sentences or a short list of items.

D. If the question calls for a student answer other than memorized facts, he or she should be told the nature of the required response or the criteria against which his/her answer will be judged, (e.g., "Your answer must be accurate to at least two decimal places" or, "Your answer must include a reference to a major theory which supports your views."

E. When using computational problems, specify the units and degree of precision that should be used in expressing the answer.

PRINCIPLES FOR COMPLETION QUESTIONS

A. There should be only one correct answer per blank.

B. Words or phrases omitted should not be trivial words or phrases, (e.g., The Declaration of independence was the first to be _____ by the United States.)

C. There should not be so many blanks that the context of the material is unclear, (e.g., The _____was the first official document to be written by _____.)

D. The omitted phrase should be no longer than three words.

E. The structure of the question should not clue the students to the correct response:
1. When *a* or *an* precedes a blank, it should be written as *a/an.*
2. Other giveaways should be avoided, such as, “The country of _____ica.”
3. All blanks should be of uniform length, (e.g., “The ____ ____ ____ was the first document ...)

F. Do not start a question with a blank.

G. Avoid using statements taken directly from textbooks, reference manuals, or other documents with one or two words omitted. Use paraphrased vocabulary and grammatical structures that are independent of the context and textbook expressions of the source document.

H. Use completition questions *only* when the recall of important ideas or words are important. Otherwise, use multiple-choice or matching because they are easier to score.

I. Consider these other issues in determining what constitutes a correct answer:
1. How complete must the answer be?
2. How accurate must the answer be?
3. Must the answer be correctly spelled?

FORMATIVE EXERCISE: COMPLETION QUESTIONS

Instructions: The following questions are designed to assess your understanding of the principles for writing completion questions. Demonstrate your ability to identify which, if any, of the principles have been violated by writing the number and letter of the principle violated in the box on the left. If one or more principles have been violated, rewrite the question in the box provided.

	Principles Violated	Possible Corrections
1.		
2.		
3.		
4.		
5.		
6.		
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8.		
9.		

Completion Questions

1. _____ _____ is the writer of such enjoyable children's books as *Ten Apples Up On* and *Green Eggs and Ham.*

2. Those who _____ the income tax today would _____ to _____ the repeal of the 15th Amendment.

3. _____ and _____, the intrepid explorers, trekked west to the _____ River and from there to _____.

4. An_____ has a tough, scaly body covering in which it can roll itself when it is endangered.

5. Brigham Young was a _____.

6. _____ led his armies into Russia in the early 1800s, but was repelled by severe weather. In modern times, _____experienced the same fate.

7. One of the component items in the nucleus of the atom is a _____.

8. When a ball is hit and lands beyond the baseline, it is ruled o_____ o____ bounds.

9. The Gettysburg Address begins with the phrase: "F__ s_____ a___ s_____ y_____ a___..."

ANSWER KEY: COMPLETITION

	Principles Violated	Possible Corrections
1.	E3, F	*Green Eggs and Ham* was written by _____.
2.	A, B, C, H	…support the repeal of which amendment? a. 15th b. 17th c. 19th d. 21st
3.	A, C, F	Lewis and Clark started their journey into the Oregon via the _____ River.
4.	E1	An animal with a tough, scaly body is a/an _____.
5.	A, E1	Who was the 2nd President of the Church? _____.
6.	F	In the 1800s, _____ was repelled at Moscow by severe weather. In modern times, _____ experienced the same fate.
7.	A, E1	The positively charged components of an atom is a/an _____.
8.	B, E2	When a ball lands beyond the right or left baseline, it is ruled _____.
9.	D, E2, E3, G	"Fourscore and seven years ago…" is the beginning of a speech called _____.

Completion Principles (Review)

A. There should be only one correct answer or phrase per blank.

B. Words or phrases omitted should not be trivial words or phrases.

C. There should not be so many blanks that the context of the material is unclear.

D. The omitted phrase should be no longer than three words.

E. The structure of the question should not clue the students to the correct response:
   1. When *a* or *an* precedes a blank, it should be written as *a/an*.
   2. Other giveaways should be avoided, such as, "The country of _____ica."
   3. All blanks should be of uniform length.

F. Do not start a question with a blank.

G. Avoid using statements taken directly from textbooks, reference manuals, or other documents with one or two words omitted. Use paraphrased vocabulary and grammatical structures that are independent of the context and textbook expressions of the source document.

H. Use completition questions *only* when the recall of important ideas or words are important. Otherwise, use multiple-choice or matching because they are easier to score.

I. Consider these other issues in determining what constitutes a correct answer:
   1. How complete must the answer be?
   2. How accurate must the answer be?
   3. Must the answer be correctly spelled?

PRINCIPLES FOR TRUE-FALSE QUESTIONS

There are many serious limitations associated with True-False items. Consequently, many experts recommend that they not be used. Nevertheless, there may be instances when you might want to use them. Below are guidelines that, if followed, should help you minimize many problems associated with these items.

A. A test should present only one idea, which can be judged as true or false, (e.g., the following question is inadequate because it represents numerous ideas to be judged: Cary Hooper was the original star of *Peyton Place* and went on to have his own T.V. show.)

B. The truth of a question should not be based on a minor point in the question. In other words, students should never be tricked.

C. Debatable questions should be connected to a source when they refer to an opinion or a theory, (e.g., “According to most astrologers, tides have an effect on men's moods.”)

D. True-false questions should be stated in a positive way, (e.g., “Astronauts have the same duties as cosmonauts;” *instead of “*Astronauts don't have the same duties as cosmonauts.” As the latter is false, students must contend with a double negative.)

E. Some adjectives are open to multiple interpretations and are often only clearly understood relative to something else. Thus, questions containing adjectives such as g*raceful, rich,* and *important* should either:
   1. be stated as a comparison, (e.g.,“Switzerland is richer in natural resources than Liechtenstein,”) or
   2. elaborate the adjective in some detail, (e.g.,“Switzerland has enough natural resources to sustain its population for 100 years.”)

F. Many superlatives such as *all, never,* and *always* should be avoided. But, a few which can be easily measured may be used, (e.g., “The *tallest* buildings in the world are the twin Petronas Towers in Kuala Lumpur, Malaysia.”)

FORMATIVE EXERCISE: TRUE-FALSE QUESTIONS

Instructions: The following questions are designed to assess your understanding of the principles for writing true-false questions. Demonstrate your ability to identify which, if any, of the principles have been violated by writing the number and letter of the principle violated in the box on the left. If one or more principles have been violated, rewrite the question in the box provided.

	Principles Violated	Possible Corrections
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

True-False Questions

1. Regular exercise decreases the risk for cardiovascular disease because it changes HDL.

2. The possession of firecrackers is illegal in Utah.

3. All evergreen trees keep their leaves in winter; all deciduous trees shed theirs in winter.

4. Plato was a Realist.

5. Fungi are parasites.

6. Dogs don't have the necessary mental faculty for learning simple psychomotor tasks.

7. Without referring to the letters of his collaborators, Goethe wrote Faust in 36 days.

8. Pi = 3.1416

9. China has the greatest military *potential* in the near future.

ANSWER KEY: TRUE-FALSE

	Principles Violated	Possible Corrections
1.	A	Regular exercise decreases the risk for cardiovascular disease.
2.	D	The possession of firecrackers is <u>legal</u> in Utah.
3.	A, B*, F	Most deciduous trees shed their leaves seasonally.
4.	OK	
5.	OK	
6.	C, D	According to dog trainers, most dogs can learn to jump through hoops, retrieve objects, etc.
7.	A, B**	Goethe wrote *Faust*.
8.	B***	Pi ≅ 3.1416
9.	C, E	According to the CIA, China has more military *potential* than the U.S.

Minor points

* Some deciduous trees live where there is no winter.

** In this question, it is trivial whether Faust was written in 36 days, versus 35 or 37 days.

*** Pi is approximately, but not exactly equal to 3.1416.

Principles for True-False Questions (Review)

A. A test should present only one idea, which can be judged as true or false.

B. The truth or falsity of a question should not be based on a minor point in the question. In other words, students should never be tricked.

C. Debatable questions should be connected to a source when they refer to an opinion or a theory.

D. True-false questions should be stated in a positive way.

E. Questions containing adjectives such as *graceful, rich,* and *important* should either:

   1. be stated as a comparison, or
   2. elaborate the adjective in some detail.

F. Many superlatives such as *all, never,* and *always* should be avoided. But, a few which can be easily measured may be used.

ALIGNMENT PRINCIPLES OF TEST CREATION

1. Clearly define the general intended learning outcomes of the course.
   a. Describe what the student should be able to do, not what the teacher is expected to do.
   b. Describe the intended product or result, not the intended process.
   c. Focus on the task the learner is expected to perform, rather than on specific topics or subject-matter content.
   d. Define only one intended outcome in each objective.
   e. Select the proper level of generality. Do not be too specific, but also avoid being too general.

List these intended learning outcomes on the syllabus.

2. Focus classroom activities, teaching and readings on meeting the intended learning outcomes of the course.

   (It will be necessary to prescribe how the general learning outcomes will be achieved by using *specific learning objectives*, which detail the content and process that will be taught and measured for each lesson or unit. It is important that, at some point during the instruction, students are told what the specific learning objectives are for that lesson. Also, it may be necessary to explain how the specific learning objectives are related to the general intended learning outcomes of the entire course. Moreover, most test questions will be created based on these lesson-by-lesson specific objectives, so it is imperative that they are closely linked with the general intended learning outcomes of the course.)

3. Assess only what was taught, read and practiced.

FORMATIVE EXERCISE: ALIGNMENT PRINCIPLES

Instructions: The following questions are designed to assess your understanding of the alignment principles of test creation. Demonstrate your ability to identify which, if any, of the principles have been violated by writing the number and letter of the principle violated in the box on the left.

	Principles Violated
1. a.	
b.	
c.	
d.	
e.	
f.	
2. a.	
b.	
c.	
d.	
e.	
f.	
3. a.	
b.	
c.	
d.	
e.	
f.	

Alignment Questions

1. Sample Intended Learning Outcomes (At the course level--to be listed on the syllabus):
   a. "Uses a step-by-step process to solve story problems."
   b. "Understands photosynthesis"
   c. "Communicate effectively"
   d. "Punctuates sentences properly"
   e. "Knows and understands basic principles of the gospel."
   f. "To increase students' ability to read weather maps."

2. Sample learning activities connected to the outcomes listed in question 1:
   a. Students solve story problems.
   b. Students watch plants grow.
   c. Students debate current issues.
   d. Students write letters to the editor.
   e. Students understand what it means to repent.
   f. Students are taught how to read weather and climate maps.

3. Test questions associated only with the above mentioned learning outcomes and activities:
   a. Rita has one dollar. She wants to buy as many pieces of 3 cent candy as she can with her dollar. How many pieces can she buy? (Sales tax is 7%.)
   b. $6H_2O + 6CO_2$ ---------> _____.
   c. Explain in no more than three sentences why America should be the World's policeman.
   d. Punctuate the following sentence: But why she asked
   f. Explain why repentance is important.
   g. What is the difference between cirrus and nimbus clouds?

ANSWER KEY: ALIGNMENT

	Alignment Answers	Possible Corrections
1. a.	1b	Provides an appropriate answer to story problems
b.	1c	Understands basic biological principles
c.	1e	Writes clear, effective English
d.	1e	Writes clear, effective English
e.	1d	Understands basic gospel principles
f.	1a	Interprets weather maps correctly
2. a.	OK	
b.	2	Students measure oxygen production and water absorption in plants
c.	2	Students follow specific guidelines as they write a position statement on a current issue
d.	2	Students edit letters to the editor
e.	OK	
f.	OK	
3. a.	OK	
b.	3	Explain the process of photosynthesis
c.	3	Using the guidelines taught in class, write a clear, effective argument about…
d.	OK	
e.	OK	
f.	3	How is a zone of high pressure indicated on a map?

Alignment Principles of Test Creation (Review)

1. Clearly define the general intended learning outcomes of the course.
   a. Describe what the student should be able to do, not what the teacher is expected to do.
   b. Describe the intended product or result, not the intended process.
   c. Focus on the task the learner is expected to perform, rather than on specific topics or subject-matter content.
   d. Define only one intended outcome in each objective.
   e. Select the proper level of generality. Do not be too specific, but also avoid being too general.

2. Focus classroom activities, teaching and readings on meeting only the intended learning outcomes of the course.

3. Assess only what was taught, read and practiced.

PRINCIPLES FOR ASSESSING HIGHER-ORDER THINKING

It is recommended that exams and other forms of assessment focus primarily on higher-order thinking. Naturally, higher-order thinking is built upon a foundation of factual information. As one assesses higher-order thinking, however, one also assesses, indirectly, this underlying factual information. At times, however, it may be necessary to assess the skill of remembering or recall. For such occasions, use only objectively-scored questions to do this.

4. Avoid questions that require recall of facts unless it is essential that these facts be remembered indefinitely.

5. Focus on understanding underlying concepts and principles.

6. Teach students how to:

a.	Apply	(e.g., apply the underlying concepts and principles of
b.	Analyze	your discipline; analysis what you are teaching; evaluate
c.	Evaluate	the merits of competing ideas in your field; and, create
d.	Create	new ideas connected to what they are learning.)

FORMATIVE EXERCISE: HIGHER-ORDER THINKING

Instructions: The following questions are designed to assess your understanding of the principles for assessment of higher-order thinking. Demonstrate your ability to identify which, if any, of the principles have been violated by writing the number and letter of the principle violated in the box on the left. If one or more principles have been violated, rewrite the question in the box provided.

	Principles Violated	Possible Corrections
1.		
2.		
3.		
4.		

Higher-Order Thinking Questions

1. What is the capital of France?

2. Sugar is a:
   a. Monosaccharide
   b. Disaccharide
   c. Oligosaccharide
   d. Polysaccharide

3. Sasha lost five pounds last week on his new diet. Although he is excited about losing weight, he does not feel particularly well. What is the most likely reason why?
   a. He is eating too few calories
   b. His diet is not well-balanced
   c. He is not accustomed to the new foods he is eating.
   d. Any physiological change, such as losing weight, causes discomfort.

4. Men perform better than women on exams that contain humor. Generate a hypothesis to explain this result, and briefly describe a study you could perform to validate your hypothesis.

ANSWER KEY: HIGHER-ORDER THINKING

	Answers	Possible Corrections
1.	5, 6	Should the capital of France be moved? Explain your answer.
2.	4, 5, 6	Suggest a substitute for sugar that has the benefits of a monosaccharide, but none of the problems. Explain why your choice is a good substitute.
3.	OK	
4.	OK	

Designing Questions that Assess Higher-Order Thinking (Review)

4. Avoid questions that require recall of facts unless it is essential that these facts be remembered indefinitely.

5. Focus on understanding underlying concepts and principles.

6. Teach students how to:
   a. Apply
   b. Analyze
   c. Evaluate
   d. Create

ANATOMY AND GLOSSARY OF TERMS

A. The Anatomy of a Multiple-Choice Question

1. Which set of words is spelled correctly? ← Stem

Distractor → A. cantalope, broccoli
Distractor → B. cheese, protien
Distractor → C. potatoe, tomatoe
Answer → D. peanut, margarine

← Options

B. The Anatomy of Matching Items

Instructions → For questions 20-21 match each Nutrient Descriptor with its corresponding Definition. Each definition may be used once or not at all.

Heading →	Nutrient Descriptor	Definition	← Heading
Premises → 21.	Healthy	A. Contains 25% less of a nutrient or kcal	← Responses
22.	High	B. Contains 10-19% of the Daily Value for that Nutrient	
		C. Contains ≥ 20% of the Daily Value for that Nutrient	
		D. Low in fat and saturated fat; also sodium and cholesterol are below established limits	